

characteristics are not typical of the genus. In other known species there is a small quadrangular PBr in each ray followed by a larger pentagonal PBr which is axillary. The first PBr in each ray of *A. divergens* is low, triangular and axillary. The proximal extremities of RR are curved under to form part of a broad basal area in other species. *A. longidactylus* Springer (1926) displays arms, which are very similar to those of the present species except for the number of primibrachials.

PALEONTOLOGY.—Cribrotetularia, a new foraminiferal genus from the Eocene of Florida. ALFRED R. LOEBLICH, JR., and HELEN TAPPAN, U. S. National Museum.

In a search for topotype specimens of genotype species, for study in a generic revision of the Foraminifera, the writers found specimens of a textularian form with a cribrate aperture in middle Eocene material from Florida. Comparison with the types showed it to be the species *Textularia coryensis* Cole. The species was described by Cole (1941, p. 21) as having an "aperture broad, low, indistinct."

A thorough rewashing of topotype material including prolonged boiling, made possible the determination of the true apertural characters which were obscured in the holotype by adhering limy material. The cribrate aperture thus revealed is reminiscent of the upper Paleozoic foraminiferal genus *Cribrostomum* Möller, and affords an interesting example of convergence in development between these two stratigraphically distant genera.

Although Cushman (1948) defines *Cribrostomum* as "test free, biserial; wall finely arenaceous, thick, with an outer thin layer; apertures of the early stages textularian, later cribrate, on the terminal face of the chamber," he also noted that it "may be only a stage in the development of *Climacammina*." This latter genus he describes as "test free, early portion biserial, later uniserial; wall arenaceous, mostly of fine fragments but including coarser ones, cement calcareous; aperture in the biserial portion textularian, in the uniserial portion irregularly cribrate, terminal." Thus he distinguished these genera as *Cribrostomum* being wholly biserial and *Climacammina* biserial

Holotype.—Collected by Richard Alexander. To be deposited in the U. S. National Museum.

Occurrence and horizon.—NW1/4SW1/4 sec. 4, T. 2 N., R. 6 E., south of Ada, Pontotoc County, Okla.; Henryhouse formation (upper), Silurian.

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All cited references are to be found in Bassler and Moody, *Bibliographic and faunal index of Paleozoic Pelmatozoan Echinoderms*. Geol. Soc. Amer. Spec. Pap. 45. 1943.

to uniserial. Möller (1879) did not exclude bigenerine forms and in fact described *Cribrostomum bradyi*, *C. commune*, *C. elegans*, *C. gracile*, *C. pyriforme*, and *C. textulariforme*, of which only the first and last "species" were illustrated as completely biserial. Möller did not designate a genotype, but included four bigenerine forms to only two of the textularian forms. The genotype was selected by Cushman (1928, p. 120) as *Cribrostomum textulariforme*. However, all of Möller's species are surprisingly alike in size, ornamentation and other characters and it seems unlikely that six true "species" would occur in such a limited horizon, all very close in appearance and with similar geographic ranges. In fact, as was stated by Plummer (1945, p. 244) "The designated genotype [*C. textulariforme*] is without doubt the immature form of one of the five bifurmed species in the group of eight "species" recorded in the same paper with the description of *Cribrostomum*. *C. commune* Möller is recorded from the same localities as *C. textulariforme* and can well be the mature form of the species."

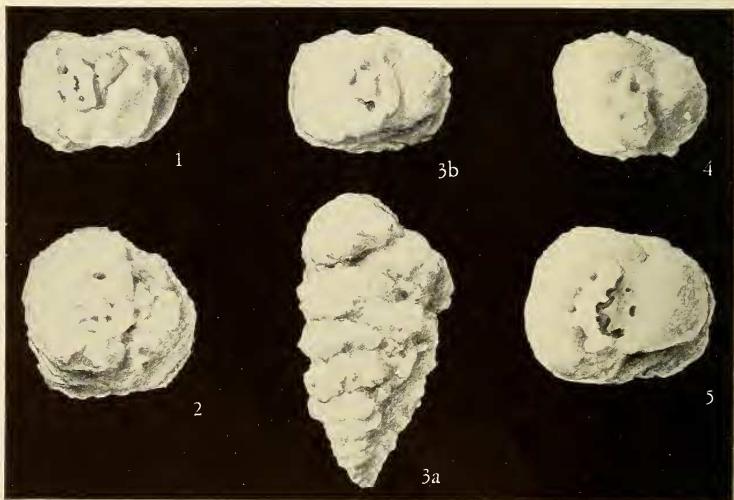
Other writers have also included bifurmed species under *Cribrostomum* including Lee and Chen (1930, pp. 96-102), Harlton (1927, p. 22) and Plummer (1945, p. 245). This genus might thus be considered synonymous with *Climacammina* H. B. Brady, 1873. However, they may be distinguished by apertural characters as was brought out by Plummer (1945, pp. 244, 245), who stated that "... symmetry in arrangement and in shape of the large and

comparatively few openings throughout the uniserial stage is a consistent feature that distinguishes the group represented by Brady's genotype of *Climacammina* from Möller's genotype of *Cribrostomum*."

Cribrostomum in the adult thus has a multiple aperture of irregularly shaped pores scattered over the terminal area with no definite pattern, whereas *Climacammina* has symmetrical pores both in shape and arrangement. A similar form, *Deckerella* Cushman and Waters, was described as like *Climacammina*, but with only two terminal pores. This "genus" is only a growth stage of *Climacammina* and the genotype species itself may have a multiple aperture of at least four openings.

Cushman regarded both *Cribrostomum* and *Climacammina* as having an arenaceous wall with calcareous cement. Galloway (1933, pp. 223, 224) stated that both are calcareous, consisting of an "inner, hyaline, fibrous or porous layer and outer darker,

very fine granular or structureless layer which is neither arenaceous nor composed of agglutinated particles but is partially a network of cryptocrystalline silica, the major portion being calcite; surface of test rough, giving an arenaceous appearance." Galloway used this type of wall structure as the basis for a new subfamily, the Palaeotextulariinae. Lee and Chen (1930, p. 100) in describing *Cribrostomum longissimoides* state "Wall composite, with a relatively thin and smooth inner layer and much thicker and coarser outer layer of arenaceous nature." Plummer (1945) corroborated these observations stating "The calcareous shell wall is almost wholly fibrous with an external coating of irregular calcareous particles or granules, so that the surface is pebbled, though composed of no adventitious matter." Plummer also noted that "the cribrate surface of chambers in the late biserial stage and throughout the uniserial stage is supported and strengthened by



FIGS. 1-5.—*Cribrotextularia coryensis* (Cole): 1, Top view of hypotype (USNM P. 67a), with final chamber broken to show slit aperture of previous chamber and supplementary apertures; 2, 4, top views of additional hypotypes (USNM P. 67 b, c) showing multiple apertures; 3a, side view of hypotype (USNM P. 67d) showing biserial chamber arrangement; 3b, top view, showing ring of apertures; 5, top view of hypotype (USNM P. 67e) with broken final chamber with part of ring of apertures visible and also showing multiple apertures of preceding chamber where final chamber is broken away. (All figures $\times 33$.)

irregularly developed walls and pillars that tie the terminal wall to the last septum, thus making the chamber labyrinthic."

The following brief description summarizes the characters of the new genus:

Family TEXTULARIIDAE

Cribrotentularia Loeblich and Tappan, n. gen.

Genotype: *Textularia coryensis* Cole. Middle Eocene of Florida.

Diagnosis.—Test free, quadrate in section; chambers biserially arranged throughout; wall arenaceous, simple in construction, not labyrinthic; aperture in early stages consisting of an arch at the base of the last chamber and in addition a symmetrical series of pores, usually in a ring, on the face of the chamber, arched aperture partially closed in later chambers and represented by a series of openings at the base of the final chamber in addition to the terminal cribrate apertures.

Remarks.—The present genus differs from both *Climacammina* and *Cribrostomum* in being wholly biserial, and in lacking any uniserial development, in being quadrate rather than oval in section, in lacking surface ornamentation, in having a simple and distinctly arenaceous wall, and not a double-layered fibrous calcareous one, and in lacking any development of pillars supporting the terminal chamber as was found in *Cribrostomum* by Plummer. It further differs from *Cribrostomum* in having a ring of symmetrically arranged rounded pores as the cribrate aperture, rather than irregularly shaped and spaced openings, and in this respect is more like *Climacammina*. However, the cribrate aperture is visible only on the final chamber, while all the pores on earlier chambers are covered by the wall of the succeeding chamber. On biserial specimens of *Cribrostomum marblense* Plummer, the cribrate aperture is visible on both chambers of the last pair.

Cribrotentularia coryensis (Cole)

Figs. 1-5

Textularia coryensis Cole, Florida Geol. Surv. Bull. 19: 21, pl. 1, fig. 13. 1941.

Test free, large, robust, triangular in side view, quadrate in section; chambers numerous, biserially arranged, increasing gradually in height and breadth as added, slightly inflated; sutures distinct, depressed, nearly straight, slightly oblique; wall agglutinated, with distinct cal-

careous fragments in a granular ground mass, surface irregular; aperture in the early stages consisting of an elongate slit at the base of the final chamber, which becomes progressively closed in later chambers with the simultaneous development of a terminal cribrate aperture of about four or five regularly spaced openings, the complete slitlike aperture has not been observed on the final chamber of any specimen, although it can be seen in the penultimate chamber of one of the hypotypes (Fig. 1), the final chamber has only a few residual pores representing the slit aperture, and a better development of the terminal cribrate aperture.

Length of figured hypotype (Fig. 3) 1.77 mm, greatest breadth 0.94 mm, thickness 0.73 mm. Other specimens are from 1.51 to 2.29 mm in length.

Types and occurrence.—Holotype and unfigured paratypes (Florida Geological Survey collections, S-1533 and S-1533A) and unfigured hypotypes also in Florida Geological Survey Collections (S-3330), figured hypotypes (USNM P. 67, a-e) all from the middle Eocene at 1,360-1,370 feet in the Peninsular Oil and Refining Co. Cory No. 1, in sec. 6, T.55S., R. 34E., Monroe County, Fla.

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